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CLAIMS:

1. An SMB system for fractionating a solution into two or more fractions, the system comprising at least two compartments having a diameter of at least about one meter and including a uniform packing of a polymer-based ion exchange resin with a bead size in the range from about 50 to about 250 μm, and wherein the system provides a mixing volume of the fluid fronts of not more than 5% of the volume of the compartment.

2. The system according to claim 1, wherein the bead size of the resin is from about 100 to about 200 μm.

3. The system according to claim 1, wherein the bead size of the resin is from about 125 to about 160 μm.

4. The system according to claim 1, wherein 75% of the beads are within +/- 20% range from the mean bead size.

5. The system according to claim 1, wherein the volume of the packed resin bed corresponds to the volume of the compartment.

6. The system according to claim 1, wherein the resin is packed uniformly in the compartments so that the resin movement in the compartments is effectively minimized.

7. The system according to claim 1, wherein the resin is a strong cation exchange resin.

8. The system according to claim 7, wherein the resin is in a monovalent metal form.

9. The system according to claim 8, wherein the monovalent metal is Na^+.

10. The system according to claim 8, wherein the monovalent metal is K^+.

11. The system according to claim 8, wherein the monovalent metal is a mixture of Na^+ and K^+.

12. The system according to claim 7, wherein the resin is in a divalent metal form.

13. The system according to claim 12, wherein the divalent metal is Ca^{++}.

14. The system according to claim 12, wherein the divalent metal is Mg^{++}.

15. The system according to claim 1, wherein the resin is a weak cation exchange resin.

16. The system according to claim 1, wherein the resin is a strong anion exchange resin.

17. The system according to claim 1, wherein the resin is a weak anion exchange resin.

18. The system according to claim 1, wherein the resin is in a gel form.

19. The system according to claim 1, wherein the height of the compartment is from about 0.2 to about 2.0 m.

20. The system according to claim 19, wherein the height of the compartment is from about 0.5 to about 1.5 m.

21. The system according to claim 1, wherein the bead size of the resin is from about 100 to 160 μm and the height of the compartment is in the range of from about 0.5 to 1.0m.

22. The system according to claim 21, wherein the ratio of the diameter to the height of the compartment is in the range of from about 6 to 12.

23. The system according to claim 20, wherein the total height of the compartments is in the range of from about 2 to 6 m.

24. The system according to claim 1, wherein the bead size of the resin is from about 170 to 250 μm and the height of the compartment is from about 1.0 to 2.0 m.

25. The system according to claim 24, wherein the ratio of the diameter to the height of the compartment is in the range of from about 2 to 6.

26. The system according to claim 24, wherein the total height of the compartments is in the range of from about 6 to 15 m.

27. The system according to claim 1, wherein the mixing volume of the fluid fronts is not more than 2% of the volume of the compartment.

28. The system according to claim 1, wherein the feed compartment is shorter than one or more of the other compartments of the system.

29. The system according to claim 28, wherein the feed compartment is shorter than the other compartments of the system.

30. The system according to claim 28, wherein the feed compartment is shorter than the next compartment of the system.

31. The system according to claim 28, wherein the height of the feed compartment is equal to or less than 1/6 of the total height of the compartments of the system.

32. The system according to claim 31, wherein the height of the feed compartment is equal to or less than 1/8 of the total height of the compartments of the system.

33.The system according to claim 28, wherein the mixing volume of the fluid fronts is not more than 5% of the volume of the shorter one of the adjacent compartments.

34. The system according to claim 33, wherein the mixing volume of the fluid fronts is not more than 2% of the volume of the shorter one of the adjacent compartments.

35. The system according to claim 1, wherein the separation factor is 0.5 – 2.0 but differs from 1.

36. The system according to claim 1, wherein the SMB system is a sequential SMB system .

37. The system according to claim 1, wherein the solution to be fractionated is selected from sulphite cooking liquors, molasses, especially B-molasses and/or C-molasses, vinasse, fructose and/or glucose syrups, beet-derived juices, invert sugar mixtures, starch hydrolysates, wood hydrolysates, milk whey solutions and other lactose-containing solutions, lactulose-containing solutions, maltose-containing solutions, maltitol-containing solutions or solutions containing amino acids.

38. The system according to claim 37, wherein the solution to be fractionated is selected from a molasses solution, a vinasse solution and a sulphite cooking liquor.

39. The system according to claim 1, wherein the product to be recovered is one or more of the following: glucose, fructose, sucrose, betaine, rhamnose, arabinose, mannose, raffinose, lactose, lactulose, maltose, maltitol, inositol, mannitol, glycerol, xylitol, xylose, sorbitol, erythritol, ribose, 6-O-α-D-glucopyranosido-D-sorbitol (1,6-GPS) and 1-O-α-D-glucopyranosido-D-mannitol (1,1-GPM), organic acids or amino acid, such as glutamic acid.

40. A process for fractionating a solution into two or more fractions with an SMB system, wherein the system comprises at least two compartments having a diameter of at least about one meter and including a uniform packing of a polymer-based ion exchange resin with a bead size in the range of about 50 to about 250 μm and wherein the mixing volume of the fluid fronts in the fractionation is not more than 5% of the volume of the compartment.